

### Vision Development Group, Inc.

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November 17, 1997

Robbie Hedeen

Attn: Office WCM-121
RCRA/TSCA Permits Team
United States Environmental Protection Agency
Region 10
1200 Sixth Avenue
Seattle, WA 98101

Re: Landau Associates, Inc.-Reports, Reichhold Chemical Property, Tacoma, WA

Dear Robbie:

On behalf of Puyallup International, Inc. and The Puyallup Tribe of Indians, attached are originals and two copies of reports regarding the Reichhold Chemical property in Tacoma, WA which has been identified for purchase by the Puyallup Indian Tribe. A portion of the property has been identified for use as a Pre-release facility under a lease between the Puyallup Tribe and the State of Washington Department of Corrections.

The reports are titled:

- Soil and Groundwater Data Review, Parcel A- Reichhold Chemicals, Inc., Tacoma, WA
- 2. Effect of Corrections Department Pre-release Facility on Selection of Cleanup Levels, Reichhold Property, Tacoma, WA

The reports are accompanied by a letter of transmittal from Landau Associates to Puyallup International. This letter summarizes and connects the two reports placing them into the context of the overall property development.

We look forward to getting your immediate initial response to the content of these reports and anticipate meeting with you again soon after the CH2M Hill report is in your possession later this week.

Please feel free to contact me at the above *new* office for additional or further information.

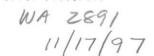
Sincerely

James J. May

cc: Mary Queitzsch-EPA

Martha Fox-Puyallup Tribe, Law Office

Bill Sullivan-Puyallup Tribe, Environmental Office





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November 17, 1997

Mr. Jay May c/o Puyallup International, Inc. 3702 Marine View Drive Tacoma, WA 98422

RE: REICHHOLD CHEMICALS, INC. TACOMA PROPERTY

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Dear Mr. May:

Enclosed are two reports regarding the Reichhold Chemicals, Inc. property in the Commencement Bay industrial area of Tacoma. As you requested, we reviewed the available documents about the property to evaluate soil and groundwater conditions at parcel A, likely impacts of contaminants at parcels B and C on parcel A, and the potential impact of a Washington State Department of Corrections prerelease facility at parcel A on the selection of cleanup levels for parcels B and C. The results of our review indicate that there is no significant contamination present at parcel A at levels that is likely to preclude construction of a Department of Corrections prerelease facility and the presence of a prerelease facility should not affect the selection of cleanup levels at parcels B and C.

The Soil and Groundwater Data Review report presents an assessment of soil and groundwater conditions on parcel A. The report concludes that soil and groundwater at parcel A pose relatively minor environmental risks. The potential risks identified in the report are described below.

A cleanup of PCBs around the former laboratory septic tanks was performed to industrial cleanup levels. If excavation occurs in this area, the soil will need to be managed appropriately. In addition, if the land use changes from industrial to standard residential, additional remedial action may be required. For the proposed use as a Department of Corrections prerelease facility, however, standard residential assumptions are not applicable and the existing concentration is unlikely to present a significant threat.

Shallow and intermediate depth groundwater at parcel A do not appear to contain concentrations of constituents of concern greater than the facility groundwater protection standards with the exception of formald-shyde. It is unlikely that additional remedial actions would be needed at parcel A to address the formald-shyde in groundwater because the groundwater is not a likely future source of groundwater and there are no cleanup levels for formald-shyde in surface water. In addition, Reichhold is operating an interceptor drain and extraction system which appear to prevent offsite migration of groundwater from parcel A.

There are a few issues that cannot be adequately evaluated due to lack of information. Soil and groundwater in the area of a former sanitary septic tank and groundwater downgradient of the laboratory septic tanks were not investigated. Conclusions regarding these areas cannot be made.

Impacts on parcel A from contamination at parcels B and C are likely to be limited to possible generation of dust or nuisance odors during remediation at parcels B and C. These potential impacts can be reduced or eliminated by the implementation of appropriate measures to control the generation of wind-blown dust and nuisance odors, if needed.

The Effect of Corrections Dept Prerelease Facility on Selection of Cleanup Levels report concludes that selection of cleanup levels at parcels B and C should not be affected by the presence of a prerelease facility at parcel A. Although inmates will reside at the prerelease facility, standard residential exposure factors are not appropriate for development of cleanup levels because no children will reside at the facility, maximum residency is expected to be 18 months, and the facility will be completely paved. A comparison of relative cleanup levels based on exposure assumptions appropriate for the prerelease facility with cleanup levels based on standard industrial exposure assumptions showed that the cleanup levels appropriate for prerelease facility residents are higher (less stringent) than industrial cleanup levels. The results of the comparison were the same using either U.S. Environmental Protection Agency or Washington State Model Toxics Control Act equations. Therefore, the selection of cleanup levels at parcels B and C should not be affected by the presence of a prerelease facility at parcel A.

Please call one of us if you have questions about these reports.

LANDAU ASSOCIATES, INC.

By:

Kristy J. Hendrickson, P.E.

Senior Engineer

and

Jerry R. Ninteman, P.E.

Senior Engineer

KJH/JRN/sms No. 424001.10

MANA ILA AAAA

### Report

## Effect of Corrections Dept. Prerelease Facility on Selection of Cleanup Levels Reichhold Property Tacoma, Washington

November 13, 1997

Prepared for

Puyallup International, Inc.

Prepared by



#### INTRODUCTION

This document presents conclusions about soil cleanup levels that might be appropriate for portions of the Reichhold property at 2340 Taylor Way if a Department of Corrections prerelease facility is constructed on the remainder of the property. The Reichhold property consists of approximately 52 acres of land in Tacoma's Commencement Bay industrial area between the Hylebos and Blair Waterways. It is our understanding that Puyallup International Inc. (PII) is evaluating the potential purchase of a portion of the property, parcel A, and subsequent lease of the parcel to the Washington State Department of Corrections for construction of a prerelease facility. The remaining portions of the property, parcels B and C, will be cleaned up by Reichhold under the Resource Conservation and Recovery Act (RCRA). Parcels A, B, and C are shown on Figure 1.

Landau Associates has reviewed information about contaminants present at parcels B and C and considered exposure pathways by which contaminants from parcels B and C might impact parcel A. We assume that EPA is considering use of standard industrial exposure factors to calculate risk-based soil cleanup levels for the site. We have developed exposure factors that would be appropriate for the Department of Corrections prerelease facility proposed for parcel A. Standard residential assumptions are not appropriate because children will not reside at the facility and inmates will reside there for a maximum of 1.5 years. To evaluate the effect the presence of a prerelease facility might have on the selection of soil cleanup levels at parcels B and C, we calculated relative cleanup levels by comparing results of the EPA and MTCA risk-based soil equations using standard industrial exposure factors with the results of the same equations using exposure factors for the prerelease facility. Cleanup levels for other media are not considered in this document in accordance with Region 10 guidance and Ecology policy that cleanup levels for media other than soil are to be the same for all sites regardless of land use.

#### CONDITIONS AT PARCELS B AND C

The Commencement Bay industrial area where the Reichhold property is located was constructed in the early 1950s by hydraulically filling the then existing tide flats with dredge spoils from the adjacent waterways. Reichhold first developed the property in 1956. Since that time Reichhold has used the property for the manufacture of a variety of chemical and chemical-related products including pentachlorophenol (PCP), formaldehyde, and polyester resins.

In 1986, Reichhold entered into a Consent Agreement and Order with the U.S. Environmental Protection Agency (EPA) pursuant to RCRA and in 1988 was issued a corrective action and storage permit. The agreement and permit required that Reichhold conduct an investigation of soil and groundwater conditions at the property and implement interim remedial measures as necessary. These investigations identified the

presence of pentachlorophenol, other chlorophenols (including 2,4,6-trichlorophenol, 2-chlorophenol, 2,4-dichlorophenol, and 2-benzyl-4-chlorophenol), and polychlorinated biphenyls (PCBs) in soil in several areas of the property. PCP and to a lesser extent, PCBs and several volatile organic compounds (VOCs) were identified in site groundwater. Numerous interim corrective actions have been implemented by Reichhold to address these contaminants including construction of a shallow aquifer interceptor drain surrounding the process areas of the property, construction of a groundwater extraction and treatment system, and excavation of contaminated soil associated with the wastewater treatment ponds and several septic tanks.

#### EXPOSURE PATHWAYS FOR CONTAMINANTS FROM PARCELS B AND C

This section evaluates potential impacts on parcel A from soil contamination present on parcels B and C. Typical exposure pathways that are examined for sites containing hazardous materials in soil and groundwater include ingestion or dermal contact with contaminated soil and groundwater, inhalation of airborne dust containing hazardous constituents, and inhalation of chemical vapors. Because the proposed prerelease facility on parcel A will be connected to a municipal water supply, ingestion of or dermal contact with contaminated groundwater from parcels B and C by prerelease facility residents is highly unlikely. Direct contact with contaminated soil at parcels B and C by prerelease facility residents is also unlikely because residents will not have access to parcels B and C and areas of parcels B and C containing hazardous constituents are likely to be capped as part of the selected corrective measure for the parcels. Exposure to vapors is unlikely because the chemicals of concern in soil are not volatile compounds.

The potential exposure pathways identified at this time are related to ingestion of, dermal contact with, or inhalation of airborne dust generated from parcels B and C and transported to parcel A. According to EPA (April 1996), fugitive dust soil screening levels for semivolatile organic compounds for inhalation are several orders of magnitude higher than the corresponding soil screening levels based on ingestion. Their conclusion is that because soil screening levels based on ingestion are adequately protective for inhalation exposure to fugitive dust for organics, the fugitive dust exposure route need not be routinely considered for organic chemicals in surface soil. Therefore, this exposure pathway is not considered further in this document.

#### SOIL CLEANUP LEVELS

We understand that EPA is considering the use of risk-based industrial cleanup levels for parcels B and C of the Reichhold property using either EPA or MTCA formulas. We assume that EPA would use standard industrial exposure factors in calculating the cleanup levels. The Reichhold property is located in an industrial area of Tacoma and meets the requirements under the Washington State Model Toxics Control Act for an industrial property.

#### EFFECT OF PRESENCE OF PRERELEASE FACILITY

A Washington State Department of Corrections prerelease facility is proposed for parcel A of the Reichhold property. Although inmates would reside at the facility prior to being released, standard residential exposure assumptions are not applicable to the facility because of the limited period during which inmates would be residents and because children would not reside there. The following assumptions regarding the prerelease facility have been made based on information provided to us by Puyallup International, Inc. and our best professional judgment:

- Persons potentially present at a prerelease facility include inmates, corrections department employees, visitors, and construction or maintenance workers.
- Inmates would reside at the facility for an average of 9 months and a maximum of 18 months each. No children will reside at the facility; therefore, standard residential assumptions based on exposure of children are not applicable.
- Industrial exposure assumptions are reasonable for Corrections Department employees; therefore, industrial cleanup levels at parcels B and C would be protective for Corrections Department employees.
- Adult visitors might be present for short visits during, at most, an 18 month period; therefore their exposure would be less than that of inmates.
- Construction or maintenance workers might be present for occasional short periods; therefore their exposure would be less than that of facility employees.
- The prerelease facility will be completely paved; therefore, the only soil present will be windblown dust.
- Only a portion of the windblown dust encountered by inmates will come from parcels B and C. Parcels B and C represent less than about one-third of the property immediately surrounding parcel A. Based on wind direction information from PSAPCA for the station at 2301 Alexander Avenue, Tacoma (i.e., near Reichhold's south gate), the wind blows from parcels B and C toward parcel A about one-third of the time. Therefore, it is reasonable to assume that parcels B and C will contribute about 33 percent of the windblown dust at parcel A.

In order to determine the potential effect of the presence of a prerelease facility at parcel A on cleanup level determination at parcels B and C, risk-based soil cleanup levels for industrial exposure through incidental ingestion of soil calculated using standard industrial exposure parameters were compared with those that would be calculated using exposure factors appropriate for the planned prerelease facility. A similar comparison based on inhalation of particulates from soil (included in Attachment A) showed similar results.

The EPA equations for calculating risk-based soil concentrations for carcinogens and noncarcinogens based on soil ingestion, the standard industrial default exposure factors, and exposure factors appropriate for the prerelease facility are discussed below, followed by the MTCA formulas and exposure factors.

#### EPA EQUATIONS AND DEFAULT ASSUMPTIONS

#### **CARCINOGENS**

$$C_s = \frac{R \times BW \times AT_c}{EF \times ED \times \left(\frac{IRS \times CSF}{10^6 \frac{mg}{kg}}\right)}$$

 $C_s$  = Risk-based concentration in soil

R = Risk level, assume 10<sup>-5</sup> for industrial exposure<sup>(1)</sup>, 10<sup>-6</sup> for residential level<sup>(1)</sup>

BW = Body weight, 70 kg for adults<sup>(2)</sup> (no children will reside at the prerelease facility)

 $AT_c$  = Averaging time, 25,550 dy (3)

EF = Exposure frequency, 250 dy/yr for industrial<sup>(2)</sup>, 365 dy/yr for prerelease facility residents

ED = Exposure duration, 25 year for industrial<sup>(2)</sup>, 1.5 year for prerelease facility residents

IRS = Soil ingestion rate, 50 mg/dy for industrial<sup>(2)</sup> and for prerelease facility residents (although the ingestion by inmates is likely to be much less because the facility will be paved and there will be limited opportunity for soil ingestion.)

 $F_{pr}$  = Fraction of windblown dust at parcel A that is from parcels B and C, estimated as 0.33

CSF = Cancer slope factor, chemical specific

pr = Prerelease facility

ind = Industrial

The risk-based soil concentration for carcinogens calculated using the EPA soil ingestion equation and modified residential exposure factors appropriate for the prerelease facility may be compared with the

<sup>(1)</sup> From Interim Final Guidelines for Developing Risk-Based Cleanup Levels at RCRA Sites in Region 10. EPA 910/9-92-019. March 31, 1992.

<sup>(2)</sup> From Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual Supplemental Guidance, Standard Default Exposure Factors. Interim Final, OSWER Directive 9285.6-03. March 25, 1991.

<sup>(3)</sup> From Region 9 Preliminary Remediation Goals. August 1, 1996.

concentration calculated using the EPA equation and standard EPA industrial default exposure factors as shown below.

$$\frac{C_{s} pr}{C_{s} ind} = \frac{EF_{pr} \times ED_{pr} \times \left(\frac{IRS_{pr} \times F_{pr} \times CSF}{10^{6} \frac{mg}{kg}}\right)}{\frac{R_{ind} \times BW \times AT_{c}}{EF_{ind} \times ED_{ind} \times \left(\frac{IRS_{ind} \times CSF}{10^{6} \frac{mg}{kg}}\right)}$$

$$\frac{C_{s pr}}{C_{s ind}} = \frac{\frac{R_{pr}}{EF_{pr} \times ED_{pr} \times IRS_{pr} \times F_{pr}}}{\frac{R_{ind}}{EF_{ind} \times ED_{ind} \times IRS_{ind}}}$$

$$\frac{C_{s pr}}{C_{s ind}} = \frac{\frac{10^{-6}}{365 \times 1.5 \times 50 \times 0.33}}{\frac{10^{-5}}{250 \times 25 \times 50}}$$

$$\frac{C_{s \ pr}}{C_{s \ ind}} = 3.5$$

Thus, for carcinogens, the allowable risk-based concentration calculated considering the effect of parcels B and C on the prerelease facility using the EPA equation and the modified residential assumptions appropriate for the prerelease facility would be about 3.5 times higher than the risk-based concentration calculated using the EPA equation and standard EPA industrial exposure factors.

#### NONCARCINOGENS

$$C_s = \frac{THQ \times BW \times AT_n}{EF \times ED \times \left(\frac{1}{RfD} \times \frac{IRS}{10^6 \frac{mg}{kg}}\right)}$$

C<sub>e</sub> = Risk-based concentration in soil

THQ = Target hazard quotient,  $1.0^{(1)}$ 

BW = Body weight, 70 kg for adult<sup>(2)</sup> (no children will reside at the prerelease facility)

 $AT_n$  = Averaging time, exposure duration in years times 365 dy/yr (3)

EF = Exposure frequency, 250 dy/yr for industrial<sup>(2)</sup>, 365 dy/yr for prerelease facility

residents

ED = Exposure duration, 25 years for industrial<sup>(2)</sup>, 1.5 years for prerelease facility residents

RFD = Reference dose, chemical specific

IRS = Soil ingestion rate, 50 mg/dy for industrial<sup>(2)</sup> and for prerelease facility residents

F<sub>pr</sub> = Fraction of windblown dust at parcel A that is from parcels B and C, estimated as

0.33

pr = Prerelease facility

ind = Industrial

The risk-based soil concentration for noncarcinogens calculated using the EPA soil ingestion equation and modified residential exposure factors appropriate for the prerelease facility may be compared with the concentration calculated using the EPA equation and standard EPA industrial default exposure factors as shown below.

$$\frac{C_{s} pr}{C_{s} ind} = \frac{EF_{pr} \times ED_{pr} \times \left(\frac{1}{RfD} \times \frac{IRS \times F_{pr}}{10^{6} \frac{mg}{kg}}\right)}{THQ \times BW \times AT_{n ind}}$$

$$EF_{ind} \times ED_{ind} \times \left(\frac{1}{RfD} \times \frac{IRS}{10^{6} \frac{mg}{kg}}\right)$$

$$\frac{C_{s pr}}{C_{s ind}} = \frac{\frac{AT_{n pr}}{EF_{pr} \times ED_{pr} \times IRS \times F_{pr}}}{\frac{AT_{n ind}}{EF_{ind} \times ED_{ind} \times IRS}}$$

$$\frac{C_{s pr}}{C_{s ind}} = \frac{\frac{1.5 \times 365}{365 \times 1.5 \times 50 \times 0.33}}{\frac{25 \times 365}{250 \times 25 \times 50}}$$

$$\frac{C_{s \ pr}}{C_{s \ ind}} = 2.1$$

Thus, for noncarcinogens, the allowable risk-based concentration calculated considering the effect of parcels B and C on the prerelease facility using the EPA equation and modified residential assumptions appropriate for the prerelease facility would be about 2.1 times higher than the risk-based concentration calculated using the EPA equation and standard EPA industrial exposure factors.

# MTCA EQUATIONS AND DEFAULT ASSUMPTIONS<sup>(4)</sup> CARCINGGENS

$$C_s = \frac{RISK \ x \ ABW \ x \ LIFE \ x \ UCF1}{CPF \ x \ SIR \ x \ ABI \ x \ DUR \ x \ FOC}$$

C<sub>s</sub> = Risk-based concentration in soil

RISK = Acceptable cancer risk level, assume 10<sup>-5</sup> for industrial exposure, 10<sup>-6</sup> for residential

level

ABW = Average body weight over the period of exposure, 70 kg for adults (no children will

reside at the prerelease facility)

<sup>(4)</sup> From MTCA Cleanup Regulation, Chapter 173-340 WAC.

LIFE Lifetime, 75 years

UCF1 = Unit conversion factor, 1, 000,000 mg/kg

**CPF** Carcinogenic Potency Factor as defined in WAC 173-340-708(8) (kg-day/mg),

chemical specific

SIR Soil ingestion rate, 50 mg/day for industrial and for prerelease facility residents

(although the ingestion by inmates is likely to be much less because the facility will

be paved and there will be limited opportunity for exposure to soil)

AB1 Gastrointestinal absorption rate (1.0)

DUR Duration of exposure, 20 years for industrial, 1.5 years for prerelease facility residents =

FOC Frequency of contact, 0.4 for industrial, conservatively assumed to be 0.33 for =

prerelease facility residents because the fraction of windblown dust at parcel A that

is from parcels B and C is estimated as 33 percent

Prerelease facility pr

Industrial ind =

The risk-based soil concentration for carcinogens calculated using the MTCA soil-ingestion equation and modified residential exposure factors appropriate for the prerelease facility may be compared with the concentration calculated using the MTCA equation and standard MTCA industrial default exposure factors as shown below.

$$\frac{C_{s \ pr}}{C_{s \ ind}} = \frac{RISK_{pr} \ x \ ABW_{pr} \ x \ LIFE \ x \ UCFI}{CPF \ x \ SIR_{pr} \ x \ ABI \ x \ DUR_{pr} \ x \ FOC_{pr}}{RISK_{ind} \ x \ ABI \ x \ DUR_{ind} \ x \ FOC_{ind}}$$

$$\frac{C_{s pr}}{C_{s ind}} = \frac{\frac{RISK_{pr} \times ABW_{pr}}{SIR_{pr} \times DUR_{pr} \times FOC_{pr}}}{\frac{RISK_{ind} \times ABW_{ind}}{SIR_{ind} \times DUR_{ind} \times FOC_{ind}}}$$

$$\frac{C_{s pr}}{C_{s ind}} = \frac{\frac{10^{-6} \times 70}{50 \times 1.5 \times 0.33}}{\frac{10^{-5} \times 70}{50 \times 20 \times 0.4}}$$

$$\frac{C_{s \ pr}}{C_{o \ ind}} = 1.6$$

Thus, for carcinogens, the allowable risk-based concentration calculated considering the effect of parcels B and C on the prerelease facility using the MTCA equation and the modified residential assumptions appropriate for the prerelease facility would be about 1.6 times higher than the risk-based concentration calculated using the MTCA equation and standard MTCA industrial exposure factors.

#### NONCARCINOGENS

Cc

$$C_s = \frac{RFD \times ABW \times UCF2 \times HQ}{SIR \times ABI \times FOC}$$

Risk-based concentration in soil

~ 2		
RFD	=	Reference Dose as defined in WAC 173-340-708(7) (mg/kg-day), chemical specific
ABW	=	Average body weight over the period of exposure, 70 kg for adults (no children will reside at the prerelease facility)
UCF2	=	Units conversion factor (1,000,000 mg/kg)
SIR	=	Soil ingestion rate, 50 mg/kg for industrial and for prerelease facility residents (although the ingestion by inmates is likely to be much less because the facility will be paved and there will be limited opportunity for exposure to soil)
AB1	=	Gastrointestinal absorption rate (1.0)
FOC	=	Frequency of contact, 0.4 for industrial, conservatively assumed to be 0.33 for prerelease facility residents because the fraction of windblown dust at parcel A that is from parcels B and C is estimated as 33 percent
HQ	=	Hazard quotient (1)

The risk-based soil concentration for noncarcinogens calculated using the MTCA soil ingestion equation and modified residential exposure factors appropriate for the prerelease facility may be compared with

the concentration calculated using the MTCA equation and standard MTCA industrial default exposure factors as shown below.

$$\frac{C_{s pr}}{C_{s ind}} = \frac{\frac{RFD \times ABW_{pr} \times UCF2 \times HQ}{SIR_{pr} \times ABI \times FOC_{pr}}}{\frac{RFD \times ABW_{ind} \times UCF2 \times HQ}{SIR_{ind} \times ABI \times FOC_{ind}}}$$

$$\frac{C_{s pr}}{C_{s ind}} = \frac{\frac{ABW_{pr}}{SIR_{pr} \times FOC_{pr}}}{\frac{ABW_{ind}}{SIR_{ind} \times FOC_{ind}}}$$

$$\frac{C_{s pr}}{C_{s ind}} = \frac{\frac{70}{50 \times 0.33}}{\frac{70}{50 \times 0.4}}$$

$$\frac{C_{s pr}}{C_{s ind}} = 1.2$$

Thus, for noncarcinogens, the allowable risk-based concentration calculated considering the effect of parcels B and C on the prerelease facility using the MTCA equation and the modified residential assumptions appropriate for the prerelease facility would be about 1.2 times higher than the risk-based concentration calculated using the MTCA equation and standard MTCA industrial exposure factors.

#### CONCLUSIONS

In order to determine if the presence of a Department of Corrections prerelease facility on parcel A of the Reichhold property would affect the selection of risk-based cleanup levels for parcels B and C, cleanup levels calculated based on exposure factors appropriate for the prerelease facility were compared with cleanup

levels calculated based on standard industrial exposure factors. The comparison was focused on exposure of prerelease facility residents because the standard industrial assumptions are expected to be applicable to Department of Corrections employees. The exposure of facility visitors is expected to be much less than that of facility residents. Although inmates will reside at the prerelease facility, standard residential exposure factors are not applicable. Children will not reside at the prerelease facility, inmates will remain at the facility for a maximum of 18 months, the surface of the facility will be paved, and only  $\tilde{a}$  portion, estimated as one-third, of the windblown dust at parcel A is likely to be from parcels B and C. The comparisons of cleanup levels showed that cleanup levels based on exposure of prerelesase facility residents were higher than cleanup levels based on standard industrial exposure factors. The results of the comparison were similar for carcinogens and noncarcinogens using either EPA or MTCA equations and exposure assumptions. Thus, industrial cleanup levels at parcels B and C will be adequately protective for the prerelease facility residents and the presence of the prerelease facility on parcel A will not affect the selection of risk-based cleanup levels at parcels B and C.

N: \424001\10\Fig1 ● MW-11, • MW-3S W-2S, 21 424001.10 Puyallup International/Prepurchase Evaluation Key Shallow Monitoring Well Intermediate Monitoring Well Deep Monitoring Well Denotes Wells Installed between September and December, 1986, 400' by CH2M Hill 200' Base Map Figure 1 er Monitoring Well Locations Scale in Feet

## RiskdEased Soil Condentations Demail Content Pathway Using EPA Equations

#### ATTACHMENT A

# RISK-BASED SOIL CONCENTRATIONS DERMAL CONTACT PATHWAY USING EPA EQUATIONS

#### CARCINOGENS

$$C_s = \frac{R \times BW \times AT_c}{EF \times ED \times \left(\frac{SA \times AF \times ABS \times CSF}{10^6 \frac{mg}{kg}}\right)}$$

Windblown dust from parcels B and C is estimated to be about one-third of the windblown dust present at parcel A; therefore, the allowable soil concentration would be about three times what is calculated by the above equation and we should compare three times the calculated soil concentration for the prerelease facility with the calculated industrial soil concentration.

$$\frac{3 \times C_{s pr}}{C_{s ind}} = \frac{3 \times \frac{R_{pr} \times BW \times AT_{c}}{EF_{pr} \times ED_{pr} \times \left(\frac{SA \times AF \times ABS \times CSF}{10^{6} \frac{mg}{kg}}\right)}}{\frac{R_{ind} \times BW \times AT_{c}}{EF_{ind} \times ED_{ind} \times \left(\frac{SA \times AF \times ABS \times CSF}{10^{-6} \frac{mg}{kg}}\right)}}$$

$$\frac{3 \times C_{s pr}}{C_{s ind}} = \frac{3 \times \frac{R_{pr}}{EF_{pr} \times ED_{pr}}}{\frac{R_{ind}}{EF_{pr} \times ED_{pr}}} = \frac{3 \times \frac{10^{-6}}{365 \times 1.5}}{\frac{10^{-5}}{250 \times 25}} = 3.4$$

Thus, for carcinogens, the allowable risk-based concentration calculated considering the prerelease facility and using the assumptions previously stated would be about 3.4 times higher than the risk-based concentration calculated using standard industrial exposure factors.

C<sub>s</sub> = Risk-based concentration in soil

R = Risk level, assume  $10^{-5}$  for industrial exposure<sup>(1)</sup>,  $10^{-6}$  for residential level<sup>(1)</sup>

BW = Body weight,  $70 \text{ kg for adult}^{(2)}$ 

 $AT_c$  = Averaging time, 25,550 dy (3)

EF = Exposure frequency, 250 dy/yr for industrial<sup>(2)</sup>, 365 dy/yr for prerelease facility

residents

ED = Exposure duration, 25 year for industrial<sup>(2)</sup>, 1.5 year for prerelease facility residents

SA = 25 percent surface area, adult,  $5,000 \text{ cm}^2/\text{dy}^{(3)}$ 

 $AF = Adherence factor, 0.2 \text{ mg/cm}^{2(3)}$ 

ABS = Skin absorption, 0.1 for organics, 0.01 for inorganics<sup>(3)</sup>

CSF = Cancer slope factor, chemical specific

pr = Prerelease facility

ind = Industrial

#### **NONCARCINGENS**

$$C_{s} = \frac{THQ \times BW \times AT_{n}}{EF \times ED \times \left(\frac{1}{RfD} \times \frac{SA \times AF \times ABS}{10^{6} \frac{mg}{kg}}\right)}$$

C<sub>s</sub> = Risk-based concentration in soil

THQ = Target hazard quotient,  $1.0^{(1)}$ 

BW = Body weight,  $70 \text{ kg for adult}^{(2)}$ 

 $AT_n$  = Averaging time, exposure duration in years times 365 dy/yr<sup>(3)</sup>

EF = Exposure frequency, 250 dy/yr for industrial<sup>(2)</sup>, 365 dy/yr for prerelease facility

residents

ED = Exposure duration, 25 year for industrial<sup>(2)</sup>, 1.5 year for prerelease facility residents

<sup>(1)</sup> From Interim Final Guidelines for Developing Risk-Based Cleanup Levels at RCRA Sites in Region 10. EPA 910/9-92-019. March 31, 1992.

<sup>(2)</sup> From Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual Supplemental Guidance, Standard Default Exposure Factors. Interim Final, OSWER Directive 9285.6-03. March 25, 1991.

<sup>(3)</sup> From Region 9 Preliminary Remediation Goals. August 1, 1996.

RfD = Reference dose, chemical specific

SA = 25 percent surface area, adult,  $5,000 \text{ cm}^2/\text{dy}^{(3)}$ 

 $AF = Adherence factor, 0.2 mg/cm^{2(3)}$ 

ABS = Skin absorption, 0.1 for organics, 0.01 for inorganics $^{(3)}$ 

pr = Prerelease facility

ind = Industrial

Windblown dust from parcels B and C is estimated to be about one-third of the windblown dust present at parcel A; therefore, the allowable soil concentration would be about three times what is calculated by the above equation and we should compare three times the calculated soil concentration for the prerelease facility with the calculated industrial soil concentration.

$$\frac{3 \times C_{s pr}}{C_{s ind}} = \frac{3 \times \frac{THQ \times BW \times AT_{n pr}}{EF_{pr} \times ED_{pr} \times \left(\frac{1}{RfD} \times \frac{SA \times AF \times ABS}{10^{6}}\right)}}{THQ \times BW \times AT_{n ind}}$$

$$\frac{THQ \times BW \times AT_{n ind}}{EF_{ind} \times ED_{ind} \times \left(\frac{1}{RfD} \times \frac{SA \times AF \times ABS}{10^{6}}\right)}$$

$$\frac{3 \times C_{s pr}}{C_{s ind}} = \frac{3 \times \frac{AT_{n pr}}{EF_{pr} \times ED_{pr}}}{\frac{AT_{n ind}}{EF_{ind} \times ED_{ind}}}$$

$$\frac{3 \times C_{s pr}}{C_{s ind}} = \frac{3 \times \frac{1.5 \times 365}{365 \times 1.5}}{\frac{25 \times 365}{250 \times 25}} = 2.1$$

Thus, for noncarcingens, the allowable risk-based concentration calculated considering the prerelease facility and using the assumptions previously stated would be 2.1 times higher than the risk-based concentration calculated using standard industrial exposure factors.

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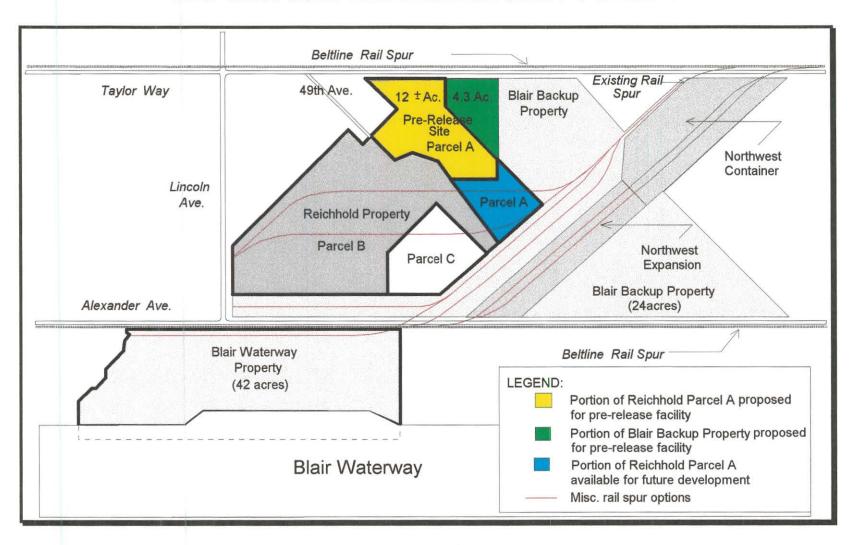
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## RELATIONSHIP OF BLAIR & REICHHOLD PROPERTIES AND PROPOSED PRE-RELEASE SITE LOCATION



### Report

# Soil and Groundwater Data Review Parcel A - Reichhold Chemicals, Inc. Tacoma, Washington

November 13, 1997

Prepared for

Puyallup International, Inc.

Prepared by



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Site Plan and Onsite Groundwater Monitoring Well Locations

#### INTRODUCTION

This document presents an assessment of soil and groundwater conditions at an approximate 15-acre parcel, referred to as Parcel A, located on the Reichhold Chemicals, Inc. (Reichhold) property in Tacoma, Washington. It is our understanding that Puyallup International Inc. (PII) is evaluating the potential purchase of Parcel A and subsequent lease of the property to the Washington State Department of Corrections for construction of a pre-release facility. The purpose of this assessment is to review existing documents prepared by CH2M Hill on soil and groundwater conditions at Parcel A of the Reichhold property in order to evaluate the potential environmental risks related to the purchase of Parcel A. This assessment also evaluates the potential impacts of Parcels B and C on Parcel A.

As part of the preparation of the document, Landau Associates reviewed 24 separate documents pertaining to the Reichhold site (see reference list at end of this document); attended meetings and conference calls with Reichhold and their consultant, CH2M Hill, to obtain information on the site; and reviewed Reichhold's project files at the site office.

#### SITE BACKGROUND

The Reichhold property consists of approximately 52 acres of land in Tacoma's Commencement Bay industrial area between the Hylebos and Blair Waterways. This area was constructed in the early 1950s by hydraulically filling the then existing tide flats with dredge spoils from the adjacent waterways. Reichhold first developed the property in 1956. Since that time, Reichhold has used the property for the manufacture of a variety of chemical and chemical-related products including pentachlorophenol (PCP), formaldehyde, and polyester resins.

The hydrogeology of the Reichhold property consists of shallow, alternating layers of sand and silt. These sequences of sand and silt were interpreted by Reichhold (CH2M Hill 1987a) as three near-surface aquifers and two near-surface aquitards. An aquitard is generally defined as a stratigraphic unit of low permeability. The three aquifers are referred to as the shallow, intermediate, and deep aquifers. The two aquitards are referred to as the upper and lower aquitards.

In 1986, Reichhold entered into a Consent Agreement and Order with the U.S. Environmental Protection Agency pursuant to the Resource Conservation and Recovery Act (RCRA) of 1976, and in 1988 Reichhold was issued a corrective action and storage permit. The agreement and permit required that Reichhold conduct an investigation of soil and groundwater conditions at the property and implement interim remedial measures as necessary to address contaminated soil and groundwater. These investigations identified the presence of PCP, other chlorophenols, polychlorinated biphenyls (PCB), and other hazardous constituents in soil in several areas of the property. PCP and to a lesser extent, PCBs and several volatile organic

compounds (VOC), were identified in site groundwater. Numerous interim corrective actions have been implemented by Reichhold to address these contaminants, including construction of a shallow aquifer interceptor drain surrounding the process areas of the property, construction of an onsite and offsite groundwater extraction system in the intermediate aquifer, construction of a groundwater treatment system, and excavation and removal of four septic tanks and associated contaminated soil. Additional information on soil and groundwater conditions at the site and interim corrective actions implemented at the site is contained in the documents obtained from Reichhold to support preparation of this document.

For purposes of this potential property transaction, the Reichhold property was divided into three parcels, Parcels A, B, and C as shown on Figure 1. According to Reichhold, only Parcels B and C were used for process-related activities. Parcel A was historically used for Reichhold's main offices; these office buildings are still present at the site (Figure 1). The main office building, however, contained a laboratory where many of the same chemicals and chemical-related products used in the process area of the property were handled. Early drawings for the laboratory in the main office building indicate that the laboratory waste was drained to four 1,000-gallon holding tanks (hereinafter referred to as the laboratory septic tanks), and that the overflow from these tanks was connected to a tile drain (CH2M Hill, 1987a). In 1974, the building was connected to the City of Tacoma sanitary sewer system. Contract documents indicate that the laboratory septic tanks were to be pumped clean and backfilled in 1974 when the building was connected to the sewer system. Records of the 1974 laboratory septic tank decommissioning apparently do not exist.

CH2M Hill (1987a) indicated that the main office building also used a septic tank for sanitary waste disposal from about 1956 until about 1974 when the building was connected to the city sewer system. This septic tank is believed to be separate from the laboratory septic tanks discussed above and is hereinafter referred to as the sanitary waste septic tank. The sanitary waste septic tank was apparently connected to a drain field on the east side of the office building. The laboratory discussed above may have also been connected to the sanitary waste septic tank, and therefore this septic tank may have also received various chemicals. Contract documents indicate that this septic tank was pumped clean and backfilled or removed in 1974. Records of this decommissioning apparently do not exist.

#### PARCEL A INVESTIGATION AND REMEDIATION

The investigation of Parcel A by Reichhold primarily focused on 1) soil within the area where the four 1,000 gallon laboratory septic tanks were suspected to have been located, 2) shallow and intermediate aquifer groundwater beneath Parcel A, and 3) soil within the southern half of the parcel [referred to by CH2M Hill (1988a) as the Nonprocess Area]. Each of these investigation areas are described below. No investigations were conducted in or around the area of the sanitary waste septic tank and drain field.

#### LABORATORY SEPTIC TANK AREA SOIL

The laboratory septic tank area is shown on Figure 1. This area was first investigated in 1986 through the installation and sampling of four soil borings (SEP-1 through SEP-4). Borings SEP-1 and SEP-2 were located in the suspected area of the laboratory septic tanks, and borings SEP-3 and SEP-4 were located in the suspected area of the drain field. Chemical analyses of a composite sample of SEP-1 and SEP-2 yielded elevated concentrations of PCBs (Aroclor-1248 at 36.3 mg/kg) which exceeded the selected PCB cleanup level of 10 mg/kg. PCP and toluene were also detected but at concentrations below the selected cleanup level. A composite sample of SEP-3 and SEP-4 did not yield elevated contaminant levels. Based on these results, it was concluded that additional investigation was needed to define the lateral and vertical extent of soil contamination in the area of the laboratory septic tanks and that the drain field area did not appear to be contaminated. Neither the septic tanks nor the drain field were located during this investigation.

The laboratory septic tank area was further investigated in 1989. Soil samples were collected from eight borings at depths of 2.5, 5.0, and 6.5 ft below ground surface (bgs). Concentrations of most constituents were generally low with the exception of PCBs, which were present in soil at concentrations of up to 360 mg/kg. Based on these results, a plan to excavate the contaminated soil and stockpile it onsite was prepared. The plan also included a verification sampling plan to demonstrate that all soil with concentrations of PCBs greater than the soil cleanup level of 10 mg/kg was removed.

Excavation of the laboratory septic tank area proceeded as planned in the Fall of 1990 with the excavated soil being placed in an onsite constructed waste pile located in Parcel B. During the initial excavation process, the four septic tanks were exposed in the eastern sidewall of the planned excavation; they were subsequently removed and placed in the waste pile along with the excavated soil. Removal of the septic tanks required expanding the original planned excavation area and verification sampling grid. The laboratory septic tank's drain field was not located during the excavation.

A total of 37 verification soil samples were collected. Evaluation of the initial laboratory results indicated that portions of the initial excavation were still above soil cleanup levels. Additional soil was then excavated and a second round of verification samples was collected. These results indicated that all samples were below the 10 mg/kg PCB cleanup level. The excavation was subsequently backfilled with clean compacted fill. The highest measured concentration in soil remaining in the laboratory septic tank area following excavation was 9.6 mg/kg in a surface sample collected at the edge of the excavation sidewall. Because this concentration exceeds MTCA residential cleanup levels for PCBs, controls may be needed to assure proper soil management if excavation is planned in this area. The soil could, however, be reused onsite (preferably as fill beneath a paved area).

#### SHALLOW AND INTERMEDIATE AQUIFER GROUNDWATER

Thirteen groundwater monitoring wells are located within Parcel A including six shallow aquifer wells, five intermediate aquifer wells, and two deep aquifer wells (Figure 1). Groundwater levels measured in January and February 1987 (i.e., prior to operation of any onsite groundwater extraction system) by Reichhold (CH2M Hill 1987) indicate that shallow aquifer groundwater beneath Parcel A flows in a northeasterly direction toward the Hylebos Waterway. Similar measurements made in the intermediate aquifer wells yielded less conclusive results, however, groundwater flow appears to be in a northeasterly direction.

All of the Parcel A wells appear to have been sampled for an extensive list of analytes at least once since the wells were installed. The only constituent that was consistently found in Parcel A wells at levels that exceed Reichhold's groundwater protection standard is formaldehyde, which as previously mentioned was produced at the Reichhold plant. The formaldehyde groundwater protection standard of 50 µg/L was exceeded at least once in three of the five Parcel A wells which were sampled for formaldehyde between 1993 and 1996 (CH2M Hill 1997a). The highest concentration was measured in MW-21S, 140 µg/L in July 1996.

The presence of formaldehyde in Parcel A groundwater would not be expected to trigger additional cleanup actions at the property because 1) Parcel A groundwater is not a likely future source of drinking water, 2) operation of the existing shallow interceptor drain and intermediate aquifer groundwater extraction system appears to prevent offsite migration of groundwater from Parcel A, and 3) formaldehyde concentrations in Parcel A wells have generally declined over the last three years (only one well, MW-21S, exceeded the groundwater protection standard for formaldehyde in 1996) and there is not currently a surface water cleanup level for formaldehyde. In addition, Reichhold is currently in the process of revising its groundwater protection standards for a number of constituents, including formaldehyde, and anticipates that noncarcinogenic health-based standards under either Method B (1,600 ug/L) or Method C (3,500 ug/L) will be the basis of the future groundwater protection standard for formaldehyde. If this revision is approved, Reichhold would be in compliance with the new standard based on existing data of formaldehyde concentrations in Parcel A groundwater.

However, institutional controls on the parcel and continued operation of the shallow interceptor drain and intermediate aquifer groundwater extraction system may be required until the groundwater protection standard is consistently achieved in all Parcel A wells or until a revised groundwater protection standard for formaldehyde is approved. Continued operation of these extraction systems should be made a requirement of the purchase agreement unless Reichhold can assure that PII will not be liable for future remediation of Parcel A groundwater contaminated with formaldehyde.

No other constituents were detected in Parcel A groundwater at concentrations that exceeded either Reichhold's groundwater protection standard or MTCA cleanup levels. Despite these results, it cannot be

conclusively stated that additional groundwater contamination is not present beneath Parcel A because no Parcel A wells are located immediately downgradient of the laboratory septic tank area or the sanitary waste septic tank. It is unlikely that a PCB plume extends downgradient of the laboratory septic tank area or sanitary septic tank area because PCBs are relatively insoluble and immobile. This conclusion is supported by soil and groundwater conditions observed in and around the North Extension Solid Waste Management Unit of the property. This unit contained PCB concentrations in soil up to 58.8 mg/kg but did not contain PCBs above detection limits in shallow groundwater monitoring well MW-9s located immediately downgradient of the unit (CH2M Hill 1987a,b). A similar conclusion, however, cannot be made for volatile organic compounds that are generally much more soluble and mobile than PCBs. If PII requires more definitive conclusions regarding groundwater quality conditions around the former septic tanks, one additional groundwater sample from a new monitoring well or temporary probe (e.g., Geoprobe) would be needed at each of the two septic tank locations.

#### NONPROCESS AREA SOIL

The Nonprocess Area, which consists of the southern half of Parcel A, was investigated by CH2M Hill (1988a) to characterize the nature and extent of inorganic constituents in nonprocess area soil and to evaluate whether these constituents might be attributed to Tacoma tideflat soil conditions rather than past operational practices at Reichhold. Soil in this area was sampled on a 100 ft grid, composited, and analyzed for 11 inorganic analytes including arsenic, chromium, copper, and lead. A total of 38 soil samples from two depth intervals (0 to 3 ft and 3 to 6 ft below ground surface) were analyzed.

None of the inorganic constituents detected in the samples were found at levels that exceeded MTCA method A residential or industrial cleanup levels. CH2M Hill (1988a) concluded that dredged sediments used to create the Reichhold site were most likely the source of the inorganic elements found in onsite soils and inorganic elements detected in groundwater underlying the site originate from the natural leaching of onsite soils. This information was used by Reichhold to conclude that Reichhold operations and waste management practices on other portions of the property do not have major impacts on inorganic constituent concentrations in soil and groundwater.

#### PARCEL B/C POTENTIAL IMPACTS ON PARCEL A

This section evaluates potential impacts on Parcel A from soil and groundwater contamination present on Parcels B and C. Potential impacts include groundwater contamination from Parcels B or C migrating onto Parcel A and exposure to airborne contamination from Parcels B or C. Based on the absence of groundwater contamination in monitoring wells located near the boundary between Parcel A and Parcels B/C (i.e., MW-7I,D, MW-9S,I, MW-12S,I, and MW-21S,I), migration of contaminated groundwater onto Parcel A from

Parcels B or C appears unlikely. The remainder of this section will discuss the second potential impact of exposure to contamination from Parcels B or C.

Typical exposure pathways that are examined for sites containing hazardous materials in soil and groundwater include ingestion or dermal contact with contaminated groundwater and soil, inhalation of airborne dust containing hazardous constituents, and inhalation of chemical vapors. Because any future development on Parcel A will be connected to a municipal water supply, exposure to contaminated groundwater from Parcels B and C by ingestion or dermal contact is highly unlikely. Direct exposure to contaminated soil from Parcels B and C is highly unlikely because access to both parcels will be restricted and all areas containing hazardous constituents are likely to be capped as part of the selected corrective measure for the parcels.

The only significant potential exposure pathway identified at this time is exposure to airborne dust or vapors generated during implementation of corrective measures on Parcels B and C. Airborne dust and vapors could potentially be generated during the excavation, handling, or onsite treatment of contaminated soil. However, proper implementation of engineering controls, including water-based dust suppression and covering of excavations and soil stockpiles, could be used to prevent the generation of airborne dust.

Control of chemical vapors may be more difficult if Reichhold implements a biological landfarming process to treat PCP-contaminated soil in the Main Disposal Area, as is currently being considered. This treatment process would involve spreading the contaminated soil over a large area (probably an acre or more), adding fertilizer and water to the soil as needed, and periodically tilling the soil to promote aerobic biodegradation of PCP. Given the volume of soil requiring treatment and the relatively slow biodegradation process, soil treatment could last for five or more years. It is unlikely that the concentration of PCP in Parcel A air would exceed health-based levels (the threshold limit value for PCP in air is 0.5 mg/m³) as a result of landfarming activities, because dilution and dispersion of the vapors would act to reduce the concentration of PCP in air with distance away from the treatment area. In addition, the volatility of PCP is relatively low.

Although the health-based levels may not be exceeded, the odor threshold for PCP is very low, and could result in PCP being detected by occupants of Parcel A. Currently, a PCP odor is commonly detected over certain areas of the property. Air quality data from a monitoring station located near Reichhold's south gate and operated by Puget Sound Air Pollution Control Agency indicates that the wind direction is from the Main Disposal Area toward Parcel A (i.e., west-southwesterly winds) about 25 percent of the time. PII may want to consider, as a condition of the purchase of Parcel A, a requirement that Reichhold will take appropriate measures to prevent the generation of wind-blown dust and nuisance odors during site remediation activities, if needed.

#### CONCLUSIONS AND RECOMMENDATIONS

The following summarizes our major conclusions and recommendations, where applicable, based on the above discussion:

- Parcel A was not used for process-related activities at the plant, however, waste from a laboratory
  contained in the main office building was drained to four 1,000-gallon septic tanks located on the
  southwest side of the main office building (referred to as the laboratory septic tanks) and may have
  been drained to another septic tank located on the east side of the building (referred to as the
  sanitary septic tank).
- Soil from around the laboratory septic tanks contained elevated levels of PCBs. The septic tanks and associated contaminated soil were removed in 1990 and verification sampling indicated that a PCB soil cleanup level of 10 mg/kg in residual soil was achieved. Because this concentration exceeds MTCA residential cleanup levels for PCBs, it is possible that additional remedial action may be required if land use changes from industrial to residential; however, paving is likely to be adequate to prevent direct contact. In addition, controls may be needed to assure proper management of this soil if excavation occurs in this area. The soil could, however, be reused onsite (preferably as fill beneath a paved area).
- The sanitary septic tank was not investigated, therefore, conclusions regarding this area cannot be presented.
- Shallow and intermediate aquifer groundwater beneath Parcel A do not appear to contain elevated concentrations of constituents of concern with the exception of formaldehyde. The presence of formaldehyde in Parcel A groundwater would not be expected to trigger additional cleanup actions at the property because 1) Parcel A groundwater is not a likely future source of drinking water, 2) operation of the existing shallow interceptor drain and intermediate aquifer groundwater extraction system appear to prevent offsite migration of groundwater from Parcel A, and 3) formaldehyde concentrations in Parcel A wells have generally declined over the last three years (only one well, MW-21S, exceeded the groundwater protection standard for formaldehyde in 1996) and there is not currently a surface water cleanup level for formaldehyde. However, institutional controls on the parcel (e.g., deed restrictions to prevent the future use of Parcel A groundwater as a drinking water source) and continued operation of the shallow interceptor drain and intermediate aquifer groundwater extraction system may be required until the groundwater protection standard is consistently achieved in all Parcel A wells or revised to a concentration greater than existing formaldehyde levels. Continued operation of these extraction systems should be made a requirement of the purchase agreement unless Reichhold can assure that PII will not be liable for future remediation of Parcel A groundwater contaminated with formaldehyde.
- Generation of dust and/or nuisance odors during future site remediation or development activities appear to be the only likely potential impacts to Parcel A from contamination present on Parcels B and C. PII may want to consider, as a condition of the purchase of Parcel A, a requirement that Reichhold will take appropriate measures to prevent the generation of wind-blown dust and nuisance odors during site remediation activities, if needed.
- Based on the available information, soil and groundwater conditions at Parcel A appear to pose
  relatively minor environmental risks with respect to the purchase of Parcel A. However, a few data
  gaps still exist, most notably the quality of groundwater downgradient of the laboratory and
  sanitary septic tank areas. In addition, as is the case at any industrialized property, the potential

exists for encountering unexpected contamination, especially during construction activities. PII may want to include in their purchase and sale agreement with Reichhold some consideration of this potential, possibly in the form of a clause identifying who will pay for such contamination issues or in determining the purchase price.

#### LIMITATIONS

The findings and opinions conveyed in this assessment are based entirely on information obtained from site documents prepared by CH2M Hill, and that Landau Associates believes are reliable. Nonetheless, Landau Associates cannot and does not guarantee the authenticity or reliability of the information it has relied upon. This assessment is not a Phase I Environmental Site Assessment (ESA) as defined in ASTM E 1527-94, although certain elements of a Phase I ESA (e.g., site history reviews) were included in the CH2M Hill documents and are therefore indirectly included within this assessment. In addition, no attempt was made to evaluate potential impacts to Parcel A from groundwater or soil contamination on adjacent properties nor did the assessment evaluate environmental conditions associated with any of the existing structures present on Parcel A (e.g., the presence of asbestos, lead paint, radon, or methane was not evaluated).

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